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## **CIRCULAR TO PROFESSIONAL INSTITUTES / ASSOCIATIONS**

### **REVISED BCA GREEN MARK CRITERIA FOR NEW BUILDINGS (VERSION 4.0)**

#### **Objective**

1 This circular is to inform industry on the upcoming revision to the Green Mark standards and the implementation timeline.

#### **Background**

2. Over the last five years, the BCA Green Mark Scheme has been the main lever to drive the adoption of sustainable green building design and practices in the building sector. With much recognition and support from the industry, it has become the national yardstick to rate the environmental performance of building. It is now a qualifying standard for determining the eligibility and grant quantum under the various green building related incentive programmes.

3. In line with government's commitment to reduce the carbon emission and energy intensity for the building sector, BCA has embarked on a review to further enhance its framework for greater energy and resource efficiency in building developments. With the first draft proposal, BCA actively engaged the industry stakeholders (about 120 developers and professionals) in last August to seek their inputs and feedback. The revised draft was subsequently disseminated for industry feedback in March this year. A total of 170 comments were received from the industry. These comments were reviewed and considered by BCA, the Green Mark Advisory Committee and two technical taskforces.

## Details of the Revision

4. This revision sets to raise the energy efficiency standard by 10% from the current standard for the basic Green Mark Certified level. The energy efficiency standards for other Green Mark levels, i.e. Gold and Gold<sup>Plus</sup> and Platinum level are also raised. Other aspects of environmental sustainability in building developments such as passive design strategies and efficient use of construction materials are given greater emphasis to encourage better resource-efficient design and practices.

5. To facilitate better understanding, we have enclosed the revised criteria and changes in Annex A for your reference. More detailed explanation on the criteria can be found in the BCA Green Mark Certification Standard for new buildings available in our website at [http://www.bca.gov.sg/EnvSusLegislation/others/GM\\_Certification\\_Std2010.pdf](http://www.bca.gov.sg/EnvSusLegislation/others/GM_Certification_Std2010.pdf). Industry briefings will also be conducted to highlight the salient changes to the requirement (Briefing details : <http://www.bca.gov.sg/GMV4/info.pdf>). Do sign up if you are interested to attend the briefing sessions via <http://www.bca.gov.sg/GMV4>.

## Implementation Timeline

6. The revised BCA Green Mark Criteria for new buildings (Version 4.0) will come into effect in 1 Dec 2010. All Green Mark applications for new buildings that are submitted on or after this date will be assessed and certified based on this version.

7. The implementation timeline for adoption of BCA Green Mark Criteria Version 4.0 in other green building initiatives are listed below :

Green Building Initiatives	Implementation Timeline
<ul style="list-style-type: none"><li>• <u>Government Land Sale (GLS) Programmes</u> Any new development located on land sold under the GLS and are required to attain the Green Mark Gold<sup>Plus</sup> or Platinum Rating</li></ul>	<ul style="list-style-type: none"><li>• Based on the GLS tender closing date.</li><li>• Projects with tender closing date on or after 1 Dec 2010 will be assessed and certified using the Revised BCA Green Mark Criteria for new buildings. (GM Version 4.0).</li></ul>
<ul style="list-style-type: none"><li>• <u>Green Mark Gross Floor Area (GM-GFA) Incentive Scheme</u> Incentives in the form of additional GFA can be granted by URA if development attains Green Mark Gold<sup>Plus</sup> or Platinum Rating</li></ul>	<ul style="list-style-type: none"><li>• Based on the submission date of BCA - GM-GFA application.</li><li>• Projects with applications submitted on or after 1 Dec 2010 will be assessed and certified using the Revised BCA Green Mark Criteria for new buildings. (GM Version 4.0).</li></ul>
<ul style="list-style-type: none"><li>• <u>Public Sector Taking the Lead</u> New public sector buildings with more than 5,000 m<sup>2</sup> air-conditioned floor area are required to attain the Green Mark Platinum Rating</li></ul>	<ul style="list-style-type: none"><li>• Based on the date of tender notices for the consultancy or design and build contract.</li><li>• The revised BCA Green Mark Criteria for new buildings (GM Version 4.0) will be applicable to public sector projects with tenders for design that are called on or after 1 Dec 2010.</li></ul>

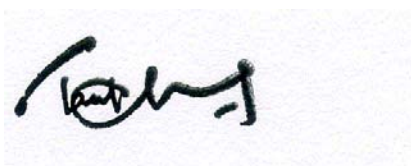
## Clarification

8. If you or your members have any queries, please do not hesitate to contact the following officers :

Subject Matter	Name	Email	Contact No.
Green Mark Criteria Non-Residential Buildings	Lim Chan Boon	<a href="mailto:lim_chan_boon@bca.gov.sg">lim_chan_boon@bca.gov.sg</a>	63255089
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Legislative requirement pertaining to Government Land Sale (GLS) Programme	Magdalene Tan	<a href="mailto:magdalene_tan@bca.gov.sg">magdalene_tan@bca.gov.sg</a>	63257163
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## Informing members

9. I would appreciate it if you could convey the contents of this circular to members of your organisation.



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# BCA Green Mark Criteria for New Buildings

## Summary of Main Changes

The revised BCA Green Mark Criteria for New Buildings (Non-Residential and Residential) GM Version 4.0 sets to achieve greater energy and resource efficiency in building developments. The proposed changes include the following :

### 1. Maximum Cap of 50 points no longer applicable

The cap of 50 points for both Energy Related Requirement and other Green Requirement will be removed to encourage design team to explore more energy or resource efficient design options. However, the minimum scoring required for both sections (i.e. Energy Related Requirement – 30 points & Other Green Requirement – 20 points) will still be applicable.

### 2. Additional Pre-requisite Requirement – Residential Building Criteria

2-1 To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout. The simulation results and the recommendations derived are to be implemented to ensure good natural ventilation. A minimum 80% of the selected typical dwelling units should have a weighted average wind velocity of 0.60 m/s. Details and submission requirements on ventilation simulation can be found in Appendix C of the Certification Standard. (*Note : Requirement similar to GM Version 3.0 but there is a change in methodology as outlined in Appendix C*). Other than the dwelling units, common areas like staircases and lobbies (excluding those that are located in basement areas) should also be designed to be naturally ventilated (i.e. to provide openable windows or other openings with aggregate area of not less than 5% of the space required to be ventilated).

2-2 Prescribed system efficiency of air-conditioning system for all dwelling units to be as follows:

Green Mark Gold <sup>Plus</sup> Green Mark Platinum	}	Air-conditioners with 4-ticks that are certified under the Singapore Energy Labelling Scheme or equivalent COP
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2-3 Minimum score under RB 3-1 Sustainable Construction

Green Mark Gold<sup>Plus</sup> ≥ 3 points

Green Mark Platinum ≥ 5 points

### 3. Additional Pre-requisite Requirement – Non-Residential Building Criteria

#### Air-Conditioned Buildings

3-1 Prescribed system efficiency of air-conditioning system to be as follows:

(i) For Buildings using Water Cooled Chilled-Water Plant:

Green Mark Rating	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Efficiency <sup>(1)</sup> (kW/RT)	
Certified	0.80	0.70
Gold	0.80	0.70
Gold <sup>Plus</sup>	0.70	0.65
Platinum	0.70	0.65

(ii) For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners:

Green Mark Rating	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Efficiency <sup>(1)</sup> (kW/RT)	
Certified	0.90	0.80
Gold	0.90	Not applicable <sup>(2)</sup>
Gold <sup>Plus</sup>	0.85	
Platinum	0.78	

Note <sup>(1)</sup> The performance of the overall air-conditioning system for the building can either be based on the efficiency at full installed capacity (exclude standby) of the system or expected operating efficiency of the system at part-load condition during the normal building operation hours as defined in the following :

<u>Office Building:</u> Monday to Friday: 9 am to 6 pm Saturday: 9 am to 11 pm  <u>Retail Mall:</u> Monday to Sunday: 10 am to 10 pm  <u>Institutional:</u> Monday to Friday: 9 am to 6 pm	<u>Hotel and Hospital:</u> 24-hour  <u>Industrial and Other Building Types:</u> To be determined based on the operating hours
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Note <sup>(2)</sup> For building with peak building cooling load of more than 500 RT, the use of air-cooled central chilled-water plant or other unitary air-conditioners are not applicable for Gold and higher ratings. In general, the system efficiency of the air-cooled chilled-water plant and unitary air-conditioners are to be comparable with the stipulated efficiency for water-cooled central chilled-water plant. Buildings that are designed with air-cooled systems and for higher Green Mark rating will be assessed on a case by case basis.



**Instrumentations for monitoring the water cooled chilled water plant efficiency**

3-2 For buildings that are designed with water cooled chilled-water plant, permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:

- (i) The installed instrumentation shall have the capability to calculate the resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.
- (ii) The location and installation of the measuring devices to meet the manufacturer's recommendation.
- (iii) Data acquisition system to have a minimum resolution of 16 bit.
- (iv) All data logging with capability to trend at 1 minute sampling time interval.
- (v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.
- (vi) Temperature sensors with minimum accuracy of  $\pm 0.05$  °C @ 0°C. All thermo-wells shall be installed in a manner which ensures that the sensors can be in direct contact with fluid flow. Provisions shall be made for each temperature measurement location to have two spare thermo-wells located at both side of the temperature sensor for verification of measurement accuracy.

**Non Air-Conditioned Buildings**

3-3 To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout. The simulation results and the recommendations derived are to be implemented to ensure good natural ventilation. Details and submission requirements on ventilation simulation can be found in Appendix C of the Certification Standard. *(Note : Requirement similar to GM Version 3.0 but there is a change in methodology as outlined in Appendix C).*

**General**

3-4 Minimum score under NRB 3-1 Sustainable Construction

Green Mark Gold<sup>Plus</sup>  $\geq$  3 points

Green Mark Platinum  $\geq$  5 points

**4. Enhance the scoring and weightage of the following criteria**

- Greater emphasis on the use of passive design strategies and more natural ventilated space. Refer NRB 1-3 & NRB 1-4 and RB 1-2 & RB 4-4.
- More weightage on Sustainable Construction to encourage recycling and the adoption of more concrete efficient design. Refer NRB3-1 and RB 3-1.
- Better water efficient fittings. Refer to NRB 2-1 and RB 2-1
- Better scoring for projects with extensive greenery provision. Refer to NRB 3-3 and RB 3-3

**5. Reduce the scoring of the criteria that are now regulated or becoming a standard practice with due consideration of the technology advancement**

- Artificial lighting
- Lift and Escalators
- Ventilation in Carparks
- Thermal Comfort
- Noise Level

**6. New Items (where applicable)**

- Mechanical Ventilation
- Daylighting Provision
- Stormwater Management
- Use of Drought Tolerant Plants
- Indoor Air Quality Management
- Carbon Footprint of Development
- Buildability Score
- Demolition Protocol

The specific details of the criteria and changes are listed as follows :

Document Ref	Description
Annex A-1	Comparison of Changes between Current Green Mark Version 3.0 and the Revised Green Mark Version 4.0 - For Non- Residential Buildings
Annex A-2	Comparison of Changes between Current Green Mark Version 3.0 and the Revised Green Mark Version 4.0 - For Residential Buildings

# Annex A - 1

Residential Building Criteria

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<p>1. RETV REQUIREMENT Refer to RB 1-1</p>	<p>Building envelope design with Envelope Thermal Transfer Value (RETV) computed based on the methodology and guidelines stipulated in the Code on Envelope Thermal Performance for Buildings and this Standard.</p> <p>Green Mark Gold<sup>Plus</sup> – RETV of 22 W/m<sup>2</sup> or lower Green Mark Platinum – RETV of 20 W/m<sup>2</sup> or lower</p>	<p>No change</p>
<p>2. VENTILATION SIMULATION Refer to RB 1-2</p>	<p>To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout.</p>	<p>No change</p> <p>Ventilation Simulation Methodology Revised Refer to Appendix C of Certification Standard for details</p> <p><i>Common areas like staircases and lobbies (excluding those that are located in basement areas) are to be designed as naturally ventilated spaces.</i></p>
<p>3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS Refer RB 1-2</p>	<p>-</p>	<p><u>NEW REQUIREMENT</u></p> <p>For Green Mark Gold<sup>Plus</sup> and Platinum projects, the prescribed system efficiency of air-conditioning system for all dwelling units to be as follows :</p> <p>Air-conditioners should have 4-ticks that are certified under the Singapore Energy Labelling Scheme or equivalent COP</p>
<p>4. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION Refer to RB 3-1</p>	<p>-</p>	<p><u>NEW REQUIREMENT</u></p> <p>Minimum score under NRB 3-1 Sustainable Construction</p> <p>Green Mark Gold<sup>Plus</sup> ≥ 3 points Green Mark Platinum ≥ 5 points</p>

Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<b>Part 1: Energy Efficiency</b>		
<u>RB 1-1 Building Envelope – Thermal Performance</u>		No change
<u>RB 1-2 Natural Ventilation and A/C Design</u>	<p><u>Dwelling Unit Indoor Comfort</u></p> <p>(a) A/C or Natural Ventilation Design</p> <ul style="list-style-type: none"> <li>• Up to 12 points for A/C certified under Singapore Energy Labelling Scheme                             <ul style="list-style-type: none"> <li>• 2 points for A/C with 2-ticks</li> <li>• 6 points for A/C with 3-ticks</li> <li>• 12 points for A/C with 4-ticks</li> </ul> </li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Up to 12 points for building layout and units designed for natural ventilation (application to development where A/C are not provided)</li> </ul> <p>(b) 4 points for using ventilation simulation to ensure good natural ventilation design</p> <p><u>Natural Ventilation in Common Areas</u></p> <ul style="list-style-type: none"> <li>• 1 point for lift lobbies and corridors</li> <li>• 1 point for staircases</li> </ul> <p>(Extent of coverage: all applicable areas)</p>	<p><u>Naturally Ventilated Design and Air-Conditioning System</u></p> <p>Option 1 – Ventilation Simulation Analysis</p> <ul style="list-style-type: none"> <li>• 0.2 point for every % of typical units with good natural ventilation</li> <li>• Up to 20 points</li> </ul> <p>Option 2 – Ventilation Design and Efficient use of Air-conditioning system</p> <ul style="list-style-type: none"> <li>• Up to 8 points for building layout and units designed for natural ventilation</li> <li>• Up to 8 points for A/C certified under Singapore Energy Labelling Scheme                             <ul style="list-style-type: none"> <li>• 4 points for A/C with 3-ticks</li> <li>• 8 points for A/C with 4-ticks</li> </ul> </li> </ul> <p><u>Natural Ventilation in Common Areas</u></p> <ul style="list-style-type: none"> <li>• 1 point for lift lobbies and corridors</li> <li>• 1 point for staircases</li> </ul> <p>(Extent of coverage: at least 80% of applicable areas)</p>

Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0								
<p><u>RB 1-3 Daylighting</u></p>	<p>Daylighting in the following common areas</p> <ul style="list-style-type: none"> <li>• 1 point for lift lobbies and corridors</li> <li>• 1 point for staircases</li> <li>• 1 point for carparks</li> <li>• (Extent of coverage : all applicable areas)</li> </ul>	<p><u>New Item</u></p> <p>(a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in CP38 and SS531.</p> <ul style="list-style-type: none"> <li>• Extent of coverage: At least 80% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable glare exposure.</li> </ul> <p>Points awarded based on the extent of perimeter daylight zones (Up to 3 points)</p> <table border="1" data-bbox="1283 589 1850 748"> <thead> <tr> <th>Distance from the Façade Perimeters (m)</th> <th>Points Allocation</th> </tr> </thead> <tbody> <tr> <td>≥ 3.0</td> <td>1</td> </tr> <tr> <td>4.0 – 5.0</td> <td>2</td> </tr> <tr> <td>&gt; 5.0</td> <td>3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>• Daylighting in the following common areas                             <ul style="list-style-type: none"> <li>• 1 point for lift lobbies and corridors</li> <li>• 1 point for staircases</li> <li>• 1 point for carparks</li> </ul> </li> </ul> <p>(Extent of coverage : At least 80% of the applicable areas)</p>	Distance from the Façade Perimeters (m)	Points Allocation	≥ 3.0	1	4.0 – 5.0	2	> 5.0	3
Distance from the Façade Perimeters (m)	Points Allocation									
≥ 3.0	1									
4.0 – 5.0	2									
> 5.0	3									
<p><u>RB 1-4 Artificial Lighting</u></p>	<ul style="list-style-type: none"> <li>• 0.3 point for every % improvement in the lighting power budget (Up to 12 points)</li> </ul>	<p>0.25 point for every % improvement in the lighting power budget (Up to 10 points)</p>								
<p><u>RB 1-5 Ventilation in Carparks</u></p>	<ul style="list-style-type: none"> <li>• 8 points for naturally ventilated carparks</li> <li>• 6 points for using CO sensors to regulate MV carparks with fume extract design</li> <li>• 4 points for using CO sensors to regulated MV carparks with or without supply</li> </ul>	<ul style="list-style-type: none"> <li>• 6 points for naturally ventilated carparks</li> <li>• 4 points for using CO sensors to regulate MV carparks with fume extract design</li> <li>• 3 points for using CO sensors to regulated MV carparks with or without supply</li> </ul>								

**Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<u>RB 1-6 Lifts</u>	<ul style="list-style-type: none"> <li>• 1 point for lifts with AC VVVF motor drive or equivalent</li> <li>• 1 point for lifts with sleep mode</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point for lifts with AC VVVF motor drive or equivalent and energy efficient features such as sleep mode features or equivalent</li> </ul>
<u>RB 1-7 Energy Efficient Features</u>		<p><u>New Item</u></p> <ul style="list-style-type: none"> <li>• Provision of vertical greenery system that helps to reduce heat gain to the building</li> <li>• Lifts with gearless drive</li> <li>• Re-generative lifts</li> </ul>
<u>RB 1-8 Renewable Energy</u>	<ul style="list-style-type: none"> <li>• 1 point for every 3 KWp of solar energy Up to 20 points</li> </ul>	<ul style="list-style-type: none"> <li>• 3 points for every 1% replacement of electricity (exclude household's usage) by renewable energy Up to 20 points</li> </ul>
<b>Part 2- Water Efficiency</b>		
<u>RB 2-1 Water Efficient Fittings</u>	<ul style="list-style-type: none"> <li>• For each categories of water efficient fittings with Water Efficiency Labelling Scheme                             <ul style="list-style-type: none"> <li>• 0.5 points for good rating</li> <li>• 1 point for very good rating</li> <li>• 2 points for excellent rating</li> </ul>                             (Extent of coverage: at least 90% of the type of fittings used)                         </li> <li>• Up to 10 points</li> </ul>	<ul style="list-style-type: none"> <li>• No point for "Good" rating fittings -MWEL</li> <li>• 8 points for "Very Good" rating fittings</li> <li>• 10 points for "Excellent" rating fittings</li> <li>• Up to 10 Points</li> </ul>
<u>RB 2-2 Water Usage Monitoring</u>		No change
<u>RB 2-3 Irrigation System &amp; Landscaping</u>		<p><u>New Item</u></p> <ul style="list-style-type: none"> <li>• 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas</li> </ul>

Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0												
<b>Part 3- Environmental Protection</b>														
<u>RB 3-1 Sustainable Construction</u>	<p>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). <i>(Requirement was previously under other green features)</i></p> <ul style="list-style-type: none"> <li>0.1 point for every percentage reduction in the prescribed CUI limit (Up to 4 points)</li> </ul>	<ul style="list-style-type: none"> <li>Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)</li> <li>1 point for the use of Green Cements at least 10% by mass for superstructural works.</li> <li>2 points for the use of RCA or WCS above or equal to the minimum usage requirement 4 points for the use of RCA or WCS above or equal to the minimum usage requirement</li> </ul> <ul style="list-style-type: none"> <li>Up to 5 points can be scored for more efficient concrete usage for building components based on CUI</li> </ul> <table border="1" data-bbox="1228 764 1898 959"> <thead> <tr> <th>Project CUI (m3/m2)</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>≤ 0.70</td> <td>1</td> </tr> <tr> <td>≤ 0.60</td> <td>2</td> </tr> <tr> <td>≤ 0.50</td> <td>3</td> </tr> <tr> <td>≤ 0.40</td> <td>4</td> </tr> <tr> <td>≤ 0.35</td> <td>5</td> </tr> </tbody> </table>	Project CUI (m3/m2)	Points	≤ 0.70	1	≤ 0.60	2	≤ 0.50	3	≤ 0.40	4	≤ 0.35	5
Project CUI (m3/m2)	Points													
≤ 0.70	1													
≤ 0.60	2													
≤ 0.50	3													
≤ 0.40	4													
≤ 0.35	5													
<u>RB 3-2 Sustainable Products</u>	<ul style="list-style-type: none"> <li>SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)</li> <li>Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)</li> </ul>	<p>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.</p> <table border="1" data-bbox="1381 1105 1812 1333"> <thead> <tr> <th colspan="3">Weightage based on the extent of environmental friendliness of products</th> <th rowspan="2">Points scored based on the weightage and the extent of coverage &amp; impact</th> </tr> <tr> <th>Good</th> <th>Very Good</th> <th>Excellent</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.5</td> <td>2</td> <td>1 point for high impact item 0.5 point for low impact item  (Up to 8 points)</td> </tr> </tbody> </table>	Weightage based on the extent of environmental friendliness of products			Points scored based on the weightage and the extent of coverage & impact	Good	Very Good	Excellent	1	1.5	2	1 point for high impact item 0.5 point for low impact item  (Up to 8 points)	
Weightage based on the extent of environmental friendliness of products			Points scored based on the weightage and the extent of coverage & impact											
Good	Very Good	Excellent												
1	1.5	2	1 point for high impact item 0.5 point for low impact item  (Up to 8 points)											



**Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0																								
<p><u>RB 3-3 Greenery Provision</u></p>	<ul style="list-style-type: none"> <li>Using Green Area Index (GAI) for computation of Greenery Provision (GnP)</li> </ul> <table border="1" data-bbox="611 410 1136 570"> <thead> <tr> <th>GnP</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>2 to &lt; 3.0</td> <td>1</td> </tr> <tr> <td>3.0 to &lt; 3.5</td> <td>2</td> </tr> <tr> <td>3.5 to &lt; 4.0</td> <td>3</td> </tr> <tr> <td>≥4.0</td> <td>4</td> </tr> </tbody> </table>	GnP	Points	2 to < 3.0	1	3.0 to < 3.5	2	3.5 to < 4.0	3	≥4.0	4	<ul style="list-style-type: none"> <li>Using Leaf Area Index (LAI) for computation of Green Plot Ratio (GnPR)</li> </ul> <table border="1" data-bbox="1318 386 1822 610"> <thead> <tr> <th>GnPR</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>1.0 to &lt; 2.0</td> <td>1</td> </tr> <tr> <td>2.0 to &lt; 3.0</td> <td>2</td> </tr> <tr> <td>3.0 to &lt; 4.0</td> <td>3</td> </tr> <tr> <td>4.0 to &lt; 5.0</td> <td>4</td> </tr> <tr> <td>5.0 to &lt; 6.0</td> <td>5</td> </tr> <tr> <td>≥ 6.0</td> <td>6</td> </tr> </tbody> </table>	GnPR	Points	1.0 to < 2.0	1	2.0 to < 3.0	2	3.0 to < 4.0	3	4.0 to < 5.0	4	5.0 to < 6.0	5	≥ 6.0	6
GnP	Points																									
2 to < 3.0	1																									
3.0 to < 3.5	2																									
3.5 to < 4.0	3																									
≥4.0	4																									
GnPR	Points																									
1.0 to < 2.0	1																									
2.0 to < 3.0	2																									
3.0 to < 4.0	3																									
4.0 to < 5.0	4																									
5.0 to < 6.0	5																									
≥ 6.0	6																									
<p><u>RB 3-4 Environmental Management Practice</u></p>	<ul style="list-style-type: none"> <li>1 point for project team comprises of GMM</li> <li>2 points for project team comprises of GMP (Up to 3 points)</li> <li>1 point for provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastics etc</li> </ul>	<ul style="list-style-type: none"> <li>0.5 point for project team comprises of GMM</li> <li>0.5 point for project team comprises of GMFM</li> <li>1 point for project team comprises of GMP (Up to 1 point)</li> <li>1 point for provision of recycling bins at each block of development for collection and storage of different recyclable waste such as paper, glass, plastics etc</li> </ul> <p><u>New Item</u> 1 point for main contractor with good track records in sustainable, environmentally friendly practices during the construction such as the Green and Gracious Builder Award.</p>																								
<p><u>RB 3-5 Green Transport</u></p>	<ul style="list-style-type: none"> <li>1 point for provision of adequate bicycles parking lots</li> </ul>	<ul style="list-style-type: none"> <li>Provision of covered/sheltered bicycles parking lots                         <ul style="list-style-type: none"> <li>0.5 point - at least 5% of no. of dwelling units</li> <li>1 point - at least 10% of dwelling units</li> </ul> </li> </ul>																								

**Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<u>RB 3-6 Stormwater Management</u>		<p><u>New Item</u> Points awarded based on the the extent of the stormwater treatment.</p> <ul style="list-style-type: none"> <li>• 3 points for treatment of run-off from more than 35% of total site area or paved area</li> <li>• 2 points for treatment of run-off from 10% to 35% of total site area</li> <li>• 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)</li> </ul>
<b>Part 4- Indoor Environmental Quality</b>		
<u>RB 4-1 Noise Level</u>		No change
<u>RB 4-2 Indoor Air Pollutants</u>	<ul style="list-style-type: none"> <li>• 2 points for use of low-VOC paints certified under the Singapore Green Labelling Scheme</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point for use of low-VOC paints certified under approved local or overseas certification body</li> </ul>
<u>RB 4-3 Waste Disposal</u>		No change
<u>RB 4-4 Indoor Air Quality in Wet Areas</u>	<ul style="list-style-type: none"> <li>• 1 point for provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets</li> </ul>	<p>Provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets</p> <ul style="list-style-type: none"> <li>• 1 point for 50%-90% of all applicable areas</li> <li>• 2 points for more than 90% of all applicable areas</li> </ul>

Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<b>Part 5- Other Green Features</b>		
<u>RB 5-1 Green Features and Innovations</u>		<u>New Items</u> <ul style="list-style-type: none"> <li>• Carbon footprint of development</li> <li>• Conservation of existing building structure such as structural elements or building envelope (<i>this item previously under RB3-1</i>)</li> <li>• Buildability Score</li> <li>• Demolition Protocol</li> <li>• Water efficient washing machines with Good rating and above.etc</li> </ul>

# Annex A - 2

Non-Residential Building Criteria

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0																			
<b>(A) Air-Conditioning Buildings</b>																					
<p>A1. ETTV REQUIREMENT Refer to NRB 1-1</p>	<p>Building envelope design with Envelope Thermal Transfer Value (ETTV) computed based on the methodology and guidelines stipulated in the Code on Envelope Thermal Performance for Buildings and this Standard.</p> <p>Green Mark Gold<sup>Plus</sup> – ETTV of 42 W/m<sup>2</sup> or lower Green Mark Platinum – ETTV of 40 W/m<sup>2</sup> or lower</p>	<p>No change</p>																			
<p>A2. ENERGY MODELING</p>	<p>To demonstrate the stipulated energy savings over its reference model using the energy modeling framework set out. Details and submission requirements on energy modeling can be found in Appendix E of the Certification Standard.</p> <p>Green Mark Gold<sup>Plus</sup> – At least 25% energy savings Green Mark Platinum – At least 30% energy savings</p>	<p>No change</p> <p>Energy Modeling Framework Revised Refer to Appendix E of Certification Standard for details</p>																			
<p>A3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS Refer NRB 1-2</p>	<p>-</p>	<p><u>NEW REQUIREMENT</u></p> <p><b>For Buildings using Water Cooled Chilled-Water Plant</b></p> <table border="1" data-bbox="1262 1068 1892 1409"> <thead> <tr> <th rowspan="3">Green Mark Rating</th> <th colspan="2">Peak Building Cooling Load (RT)</th> </tr> <tr> <th>&lt; 500</th> <th>≥ 500</th> </tr> <tr> <th colspan="2">Efficiency (kW/RT)</th> </tr> </thead> <tbody> <tr> <td>Certified</td> <td>0.80</td> <td>0.70</td> </tr> <tr> <td>Gold</td> <td>0.80</td> <td>0.70</td> </tr> <tr> <td>Gold<sup>Plus</sup></td> <td>0.70</td> <td>0.65</td> </tr> <tr> <td>Platinum</td> <td>0.70</td> <td>0.65</td> </tr> </tbody> </table>	Green Mark Rating	Peak Building Cooling Load (RT)		< 500	≥ 500	Efficiency (kW/RT)		Certified	0.80	0.70	Gold	0.80	0.70	Gold <sup>Plus</sup>	0.70	0.65	Platinum	0.70	0.65
Green Mark Rating	Peak Building Cooling Load (RT)																				
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	Efficiency (kW/RT)																				
Certified	0.80	0.70																			
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Gold <sup>Plus</sup>	0.70	0.65																			
Platinum	0.70	0.65																			

Non-Residential Building Criteria

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0																	
<p>A3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS</p> <p>Refer NRB 1-2</p>	<p>-</p>	<p><b>For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners</b></p> <table border="1" data-bbox="1262 342 1881 699"> <thead> <tr> <th rowspan="3">Green Mark Rating</th> <th colspan="2">Peak Building Cooling Load (RT)</th> </tr> <tr> <th>&lt; 500</th> <th>≥ 500</th> </tr> <tr> <th colspan="2">Efficiency (kW/RT)</th> </tr> </thead> <tbody> <tr> <td>Certified</td> <td>0.90</td> <td>0.80</td> </tr> <tr> <td>Gold</td> <td>0.90</td> <td rowspan="3">Not applicable</td> </tr> <tr> <td>Gold<sup>Plus</sup></td> <td>0.85</td> </tr> <tr> <td>Platinum</td> <td>0.78</td> </tr> </tbody> </table>	Green Mark Rating	Peak Building Cooling Load (RT)		< 500	≥ 500	Efficiency (kW/RT)		Certified	0.90	0.80	Gold	0.90	Not applicable	Gold <sup>Plus</sup>	0.85	Platinum	0.78
Green Mark Rating	Peak Building Cooling Load (RT)																		
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	Efficiency (kW/RT)																		
Certified	0.90	0.80																	
Gold	0.90	Not applicable																	
Gold <sup>Plus</sup>	0.85																		
Platinum	0.78																		
<p>A4. INSTRUMENTATION – MONITORING OF WATER COOLED CHILLED-WATER PLANT EFFICIENCY</p> <p>Refer to NRB 1-2</p>	<p>-</p>	<p><b>NEW REQUIREMENT</b></p> <p>For buildings that are designed with Water Cooled Chilled-Water Plant, permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:</p> <ul style="list-style-type: none"> <li>(i) The installed instrumentation shall have the capability to calculate a resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.</li> <li>(ii) The location and installation of the measuring devices to meet the manufacturer’s recommendation.</li> <li>(iii) Data acquisition system to have a minimum resolution of 16 bit.</li> <li>(iv) All data logging with capability to trend at 1 minute sampling time interval.</li> <li>(v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.</li> </ul>																	

**Non-Residential Building Criteria**

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<p>A4. INSTRUMENTATION – MONITORING OF WATER COOLED CHILLED-WATER PLANT EFFICIENCY</p> <p>Refer to NRB 1-2</p>	-	<p>(vi) Temperature sensors with minimum accuracy of <math>\pm 0.05</math> °C @ 0°C. All thermo-wells shall be installed in a manner which ensures that the sensors can be in direct contact with fluid flow. Provisions shall be made for each temperature measurement location to have two spare thermo-wells located at both side of the temperature sensor for verification of measurement accuracy.</p>
<p>A5. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION</p> <p>Refer to NRB 3-1</p>	-	<p><u>NEW REQUIREMENT</u>                      Minimum score under NRB 3-1 Sustainable Construction                      Green Mark Gold<sup>Plus</sup> <math>\geq</math> 3 points                      Green Mark Platinum <math>\geq</math> 5 points</p>
<p>Non Air-Conditioning Buildings</p>		
<p>B1. VENTILATION SIMULATION</p> <p>Refer to NRB 1-4</p>	<p>To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout.</p>	<p>No change</p>
<p>B2. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION</p> <p>Refer to NRB 3-1</p>	-	<p><u>NEW REQUIREMENT</u>                      Minimum score under NRB 3-1 Sustainable Construction                      Green Mark Gold<sup>Plus</sup> <math>\geq</math> 3 points                      Green Mark Platinum <math>\geq</math> 5 points</p>

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<b>Part 1 – Energy Efficiency</b>		
<u>NRB 1-1 ETTV</u>	<ul style="list-style-type: none"> <li>• 2 points for every reduction of 1 W/m<sup>2</sup> in ETTV from the baseline</li> <li>• 42.5 W/m<sup>2</sup> to achieve max 15 points</li> </ul>	<ul style="list-style-type: none"> <li>• 1.2 points for every reduction of 1 W/m<sup>2</sup> in ETTV from the baseline</li> <li>• 40 W/m<sup>2</sup> to achieve max 12 points</li> </ul>
<u>NRB 1-2 Air-Conditioning System</u>	<p><u>Air- Conditioned Plant</u></p> <ul style="list-style-type: none"> <li>• 1.45 points for every % improvement in chiller, chilled-water pump and condenser water pump</li> <li>• 0.05 point for every % improvement in cooling towers efficiency</li> <li>• Max 20 points</li> </ul>	<p>(a) Water Cooled Chilled-Water Plant</p> <p><u>Building Cooling Load &gt; 500RT</u></p> <ul style="list-style-type: none"> <li>• Min Air-Conditioned System Efficiency ≤ 0.7 kW/RT</li> </ul> <p>15 points for meeting the prescribed chilled-water plant efficiency of 0.70 kW/RT</p> <p>0.25 point for every percentage improvement in the chilled-water plant efficiency over the baseline</p> <p><u>Building Cooling Load ≤ 500RT</u></p> <ul style="list-style-type: none"> <li>• Min Air Conditioned System Efficiency of 0.8 kW/RT</li> </ul> <p>12 points for meeting the prescribed chilled-water plant efficiency of 0.80 kW/RT</p> <p>0.45 point for every percentage improvement in the chilled-water plant efficiency over the baseline</p> <p>(Up to 20 point)</p>



**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<p><u>NRB 1-2 Air-Conditioning System</u></p>	<p><u>Unitary Air-conditioners</u></p> <ul style="list-style-type: none"> <li>• 1.5 points for every % improvement</li> <li>Max 25 points</li> </ul> <p><u>Air distribution system</u></p> <ul style="list-style-type: none"> <li>• 0.5 point for every % improvement</li> <li>• 10% improvement to achieve max 5 points</li> </ul>	<p><u>Air Cooled Chilled-Water Plant/Unitary Air-Conditioners</u></p> <p><u>Building Cooling Load &gt; 500RT</u></p> <ul style="list-style-type: none"> <li>• Min Air-Conditioned System Efficiency <math>\leq 0.8</math> kW/RT</li> </ul> <p>12 points for meeting the prescribed air-conditioning system efficiency of 0.80 kW/RT</p> <p>1.3 points for every percentage improvement in the air-conditioning system efficiency over the baseline</p> <p><u>Building Cooling Load <math>\leq 500</math>RT</u></p> <ul style="list-style-type: none"> <li>• Min Air Conditioned System Efficiency of 0.9 kW/RT</li> </ul> <p>10 points for meeting the prescribed air-conditioning system efficiency of 0.90 kW/RT</p> <p>0.6 point for every percentage improvement in the air-conditioning system efficiency over the baseline</p> <p>(Up to 20 points)</p> <p><u>Air distribution system</u></p> <ul style="list-style-type: none"> <li>• 0.2 point for every % improvement</li> <li>• 30% improvement to achieve max 6 points</li> <li>• More stringent requirement for VAV baseline as stated in SS553</li> </ul>

**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<u>NRB 1-2 Air-Conditioning System</u>		<p><u>New Items</u></p> <ul style="list-style-type: none"> <li>• 1 point - Provision of variable speed control for chiller plant equipment</li> <li>• 1 point – Instrumentation for monitoring water cooled chilled-water plant efficiency – <i>Prerequisite Requirement</i></li> <li>• 1 point – Verification of central chilled-water plant instrumentation : Heat balance to be computed and in accordance with AHRI 550/590</li> </ul>
<u>NRB 1-3 Building Envelope – Design / Thermal Parameters</u>	<ul style="list-style-type: none"> <li>• 24 points for no west facing façade</li> <li>• Better Thermal Transmittance (U value) of roof 2 points for every 0.1 W/m<sup>2</sup>K reduction</li> </ul>	<ul style="list-style-type: none"> <li>• <u>30 points</u> for no west facing façade</li> <li>• Better Thermal Transmittance (U value) of roof 1 point for every 0.1 W/m<sup>2</sup>K reduction</li> </ul>
<u>NRB 1-4 Natural Ventilation / Mechanical Ventilation</u>	<ul style="list-style-type: none"> <li>• Max 8 points for 100% of the buildings achieving good natural ventilation</li> <li>• 5 points for ventilation simulation &amp; implementation of identified effective building design</li> <li>• Max 13 points</li> </ul>	<ul style="list-style-type: none"> <li>• Max 10 points for 100% of the buildings achieving good natural ventilation</li> <li>• 5 points for the use of ventilation simulation &amp;</li> <li>• 5 points for implementation of identified effective building design</li> <li>• Max <u>20 points</u></li> </ul> <p><u>New Item</u></p> <ul style="list-style-type: none"> <li>• 15 points for 25% improvement in mechanical ventilation system efficiency from the stipulated SS553 baseline</li> </ul>
<u>NRB 1-5 Daylighting</u>	-	<p><u>New Items</u></p> <p>(a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in SS 531:Part 1:2006 – Code of Practice for Lighting of Work Places.</p> <ul style="list-style-type: none"> <li>• Extent of coverage: At least 75% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable</li> </ul>

**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0								
<u>NRB 1-5 Daylighting – cont'd</u>	-	glare exposure. Points awarded based on the extent of perimeter daylight zones (Up to 3 points) <table border="1" data-bbox="1308 350 1875 508"> <thead> <tr> <th>Distance from the Façade Perimeters (m)</th> <th>Points Allocation</th> </tr> </thead> <tbody> <tr> <td>≥ 3.0</td> <td>1</td> </tr> <tr> <td>4.0 – 5.0</td> <td>2</td> </tr> <tr> <td>&gt; 5.0</td> <td>3</td> </tr> </tbody> </table> (b) Daylighting for common areas such as toilets, staircases, corridors <ul style="list-style-type: none"> <li>• 0.5 point each, with at least 80 % of each applicable area for extent of coverage</li> </ul>	Distance from the Façade Perimeters (m)	Points Allocation	≥ 3.0	1	4.0 – 5.0	2	> 5.0	3
Distance from the Façade Perimeters (m)	Points Allocation									
≥ 3.0	1									
4.0 – 5.0	2									
> 5.0	3									
<u>NRB 1-6 Artificial Lighting</u>	0.5 point for every percentage improvement in lighting power budget -	0.3 point for every percentage improvement in lighting power budget								
<u>NRB 1-7 Ventilation in Carparks</u>	<ul style="list-style-type: none"> <li>• 5 points for naturally ventilated carparks</li> <li>• 4 points for Fume extract</li> <li>• 3 points MV with or without supply</li> </ul>	<ul style="list-style-type: none"> <li>• 4 points for naturally ventilated</li> <li>• 2.5 points for Fume extract</li> <li>• 2 points MV with or without supply</li> </ul>								
<u>NRB 1-8 Ventilation in Common Areas</u>	-	No change								
<u>NRB 1-9 Lifts and Escalators</u>	<ul style="list-style-type: none"> <li>• 1 point for lifts with the AC variable voltage and variable frequency (VVVF) motor drive and</li> <li>• 1 point for sleep mode</li> <li>• 1 point for escalators with energy efficient features such as motion sensors</li> </ul>	Both sleep mode and VVVF motor drive implemented: <ul style="list-style-type: none"> <li>• All lifts and escalators - 2 points</li> <li>• All lifts or escalators - 1 point</li> </ul>								

**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0											
<p><u>NRB 1-10 Energy Efficient Practices &amp; Features</u></p>	<ul style="list-style-type: none"> <li>• 3 points for every 1% energy saving over the total building energy consumption (Up to 11 point)</li> </ul>	<ul style="list-style-type: none"> <li>• 3 points for every 1% energy saving over the total building energy consumption (Up to 10 points)</li> </ul> <p><u>New Items</u></p> <ul style="list-style-type: none"> <li>• Use of vertical greenery system that helps to reduce heat gain to buildings</li> <li>• Re-generative lifts</li> <li>• Lifts with gearless drive</li> </ul>											
<p><u>NRB 1-11 Renewable Energy</u></p>	<p>5 points for every 1% replacement of electricity (based on the total electricity consumption including tenant's usage) by renewable energy</p> <p>OR</p> <p>3 points for every 1% replacement of electricity (based on the total electricity consumption excluding tenant's usage) by renewable energy</p> <p>(Up to 20 Points)</p>	<p>Point scored based on the expected energy efficiency index (EEI) and % replacement of electricity by renewable energy source (Up to 20 points)</p> <table border="1" data-bbox="1253 737 1890 1117"> <thead> <tr> <th data-bbox="1253 737 1470 987" rowspan="2">Expected Energy Efficiency Index (EEI)</th> <th colspan="2" data-bbox="1470 737 1890 867">Every 1 % replacement of electricity (based on total electricity consumption) by renewable energy source</th> </tr> <tr> <th data-bbox="1470 867 1680 987">Include tenant's usage</th> <th data-bbox="1680 867 1890 987">Exclude tenant's usage</th> </tr> </thead> <tbody> <tr> <td data-bbox="1253 987 1470 1052">≥ 30 kWh/m<sup>2</sup>/yr</td> <td data-bbox="1470 987 1680 1052">5 points</td> <td data-bbox="1680 987 1890 1052">3 points</td> </tr> <tr> <td data-bbox="1253 1052 1470 1117">&lt; 30 kWh/m<sup>2</sup>/yr</td> <td data-bbox="1470 1052 1680 1117">3 points</td> <td data-bbox="1680 1052 1890 1117">1.5 points</td> </tr> </tbody> </table>	Expected Energy Efficiency Index (EEI)	Every 1 % replacement of electricity (based on total electricity consumption) by renewable energy source		Include tenant's usage	Exclude tenant's usage	≥ 30 kWh/m <sup>2</sup> /yr	5 points	3 points	< 30 kWh/m <sup>2</sup> /yr	3 points	1.5 points
Expected Energy Efficiency Index (EEI)	Every 1 % replacement of electricity (based on total electricity consumption) by renewable energy source												
	Include tenant's usage	Exclude tenant's usage											
≥ 30 kWh/m <sup>2</sup> /yr	5 points	3 points											
< 30 kWh/m <sup>2</sup> /yr	3 points	1.5 points											

**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<b>Part 2 – Water Efficiency</b>		
<u>NRB 2-1 Water Efficient Fittings</u>	<ul style="list-style-type: none"> <li>• 4 points for “Good” rating fittings</li> <li>• 6 points for “Very Good” rating fittings</li> <li>• 8 points for “Excellent” rating fittings</li> <li>• Up to 8 points</li> </ul>	<ul style="list-style-type: none"> <li>• No point for “Good” rating fittings -MWEL</li> <li>• 8 points for “Very Good” rating fittings</li> <li>• 10 points for “Excellent” rating fittings</li> <li>• Up to 10 Points</li> </ul>
<u>NRB 2-2 Water Usage and Leak Detection</u>		No change
<u>NRB 2-3 Irrigation System and Landscaping</u>	-	<u>New Item</u> <ul style="list-style-type: none"> <li>• 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas</li> </ul>
<u>NRB 2-4 Water Consumption of Cooling Tower</u>	<ul style="list-style-type: none"> <li>• 1 point- Cooling tower water treatment system which can achieve 6 or better cycles of concentration</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point - Cooling tower water treatment system which can achieve <u>7</u> or better cycles of concentration</li> </ul>

Non-Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0											
<b>Part 3 - Environmental Protection</b>													
<p><u>NRB 3-1 Sustainable Construction</u></p>	<p>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). <i>(Requirement was previously under other green features)</i></p>	<ul style="list-style-type: none"> <li>Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)</li> <li>1 point for the use of Green Cements at least 10% by mass for superstructural works.</li> <li>2 points for the use of RCA or WCS above or equal to the minimum usage requirement</li> <li>4 points for the use of RCA or WCS above or equal to the minimum usage requirement</li> </ul>											
	<ul style="list-style-type: none"> <li>0.1 point for every percentage reduction in the prescribed CUI limit (Up to 4 points)</li> </ul>	<ul style="list-style-type: none"> <li>Up to 5 points can be scored for more efficient concrete usage for building components based on CUI</li> </ul> <table border="1" data-bbox="1268 768 1908 963"> <thead> <tr> <th>Project CUI (m3/m2)</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>≤ 0.70</td> <td>1</td> </tr> <tr> <td>≤ 0.60</td> <td>2</td> </tr> <tr> <td>≤ 0.50</td> <td>3</td> </tr> <tr> <td>≤ 0.40</td> <td>4</td> </tr> <tr> <td>≤ 0.35</td> <td>5</td> </tr> </tbody> </table>	Project CUI (m3/m2)	Points	≤ 0.70	1	≤ 0.60	2	≤ 0.50	3	≤ 0.40	4	≤ 0.35
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<p><u>NRB 3-2 Sustainable Products</u></p>	<ul style="list-style-type: none"> <li>SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)</li> <li>Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)</li> </ul>	<p>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.</p> <table border="1" data-bbox="1318 1138 1749 1360"> <tr> <td colspan="3">Weightage based on the extent of environmental friendliness of products</td> <td rowspan="3">Points scored based on the weightage and the extent of coverage &amp; impact  1 point for high impact item 0.5 point for low impact item  (Up to 8 points)</td> </tr> <tr> <td>Good</td> <td>Very Good</td> <td>Excellent</td> </tr> <tr> <td>1</td> <td>1.5</td> <td>2</td> </tr> </table>	Weightage based on the extent of environmental friendliness of products			Points scored based on the weightage and the extent of coverage & impact  1 point for high impact item 0.5 point for low impact item  (Up to 8 points)	Good	Very Good	Excellent	1	1.5	2	
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**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0																								
<p><u>NRB 3-3 Greenery Provision</u></p>	<table border="1" data-bbox="621 277 1230 440"> <thead> <tr> <th>GnPR</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>0.5 to &lt; 1.0</td> <td>1</td> </tr> <tr> <td>1.0 to &lt; 1.5</td> <td>2</td> </tr> <tr> <td>1.5 to &lt; 3.0</td> <td>3</td> </tr> <tr> <td>3.0 to &lt; 3.5</td> <td>4</td> </tr> </tbody> </table> <ul data-bbox="611 505 1241 565" style="list-style-type: none"> <li>Using the Green Area Index (GAI) for computation of Greenery Provision.</li> </ul>	GnPR	Points	0.5 to < 1.0	1	1.0 to < 1.5	2	1.5 to < 3.0	3	3.0 to < 3.5	4	<table border="1" data-bbox="1268 277 1906 500"> <thead> <tr> <th>GnPR</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>0.5 to &lt; 1.0</td> <td>1</td> </tr> <tr> <td>1.0 to &lt; 1.5</td> <td>2</td> </tr> <tr> <td>1.5 to &lt; 3.0</td> <td>3</td> </tr> <tr> <td>3.0 to &lt; 3.5</td> <td>4</td> </tr> <tr> <td>3.5 to &lt; 4.0</td> <td>5</td> </tr> <tr> <td>≥ 4.0</td> <td>6</td> </tr> </tbody> </table> <ul data-bbox="1268 505 1898 565" style="list-style-type: none"> <li>Using the Leaf Area Index (LAI) for computation of Green Plot Ratio.</li> </ul>	GnPR	Points	0.5 to < 1.0	1	1.0 to < 1.5	2	1.5 to < 3.0	3	3.0 to < 3.5	4	3.5 to < 4.0	5	≥ 4.0	6
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<p><u>NRB 3-4 Environmental Management Practice</u></p>	<ul data-bbox="611 613 1220 708" style="list-style-type: none"> <li>1 point for project team comprises certified GMM</li> <li>2 point for project team comprises certified GMP (Up to 3 points)</li> </ul>	<ul data-bbox="1268 613 1908 740" style="list-style-type: none"> <li>0.5 point for project team comprises certified GMM</li> <li>0.5 point for project team comprises certified GMFM</li> <li>1 point for project team comprises certified GMP (Up to 1 points)</li> </ul> <p><u>New Item</u></p> <ul data-bbox="1268 805 1908 894" style="list-style-type: none"> <li>1 point for main contractor with good track records in sustainable, environmental friendly practices such as the Green and Gracious Builder Award</li> </ul>																								
<p><u>NRB 3-5 Green Transport</u></p>	<ul data-bbox="611 943 1094 976" style="list-style-type: none"> <li>1 point - Adequate bicycle parking lots</li> </ul>	<p>Criterion previously known as Public Transport Accessibility</p> <ul data-bbox="1268 1036 1908 1162" style="list-style-type: none"> <li>Provision of covered/sheltered bicycles parking lots with adequate shower facilities</li> <li>1 point if no. of bicycle lots ≥ 3% of GFA/10</li> <li>1 point if no. of bicycle lots ≥ 1.5% of GFA/10</li> </ul> <p><u>New Items</u></p> <ul data-bbox="1268 1222 1908 1377" style="list-style-type: none"> <li>1 point - provision of covered walkway to facilitate connectivity and use of public transport</li> <li>1 point - provision of hybrid/electric vehicle refueling/ recharge stations and priority parking lots within the development.</li> </ul>																								

**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<u>NRB 3-6 Refrigerants</u>	-	No change
<u>NRB 3-7 Stormwater Management</u>	-	<p><u>New Item</u> Points awarded based on the the extent of the stormwater treatment.</p> <ul style="list-style-type: none"> <li>• 3 points for treatment of run-off from more than 35% of total site area or paved area</li> <li>• 2 points for treatment of run-off from 10% to 35% of total site area</li> <li>• 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)</li> </ul>
<b>Part 4 – Indoor Environmental Quality</b>		
<u>NRB 4-1 Thermal Comfort</u>	<ul style="list-style-type: none"> <li>• 2 points - indoor temperature between 22.5 and 25.5°C; RH &lt; 70%</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point - indoor operative temperature between 24 to 26 °C; Relative Humidity &lt; 65%</li> </ul>
<u>NRB 4-2 Noise Level</u>	<ul style="list-style-type: none"> <li>• 2 points for good ambient sound levels as recommended in CP 13</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point for good ambient sound levels as recommended in SS 553</li> </ul>
<u>NRB 4-3 Indoor Air Pollutants</u>	<ul style="list-style-type: none"> <li>• 1 point for use of adhesives under SGLS for composite wood products</li> </ul>	<ul style="list-style-type: none"> <li>• 1 point for use of environmental friendly adhesives certified by approved local certification body</li> </ul>
<u>NRB 4-4 Indoor Air Quality Management</u>	-	<p><u>New Items</u></p> <ul style="list-style-type: none"> <li>• 1 point for provision of filtration media and differential pressure monitoring equipment.</li> <li>• 1 point for implementing effective IAQ management plan to ensure that building ventilation systems are clean and free from debris. Internal surface condition testing for ACMV systems are to be included.</li> </ul>



**Non-Residential Building Criteria**

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
NRB 4-5 High Frequency Ballasts	-	Renumbered from 4-4 to 4-5

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
<b>Part 5 – Other Green Features</b>		
<u>NRB 5-1 Green Features and Innovations</u>		<p><b><u>New Items</u></b></p> <ul style="list-style-type: none"> <li>• Carbon footprint of development)</li> <li>• Conservation of existing building structure such as structural elements or building envelope (<i>this item was previously under NRB 3-1</i>)</li> <li>• Buildability Score</li> <li>• Demolition Protocol</li> </ul>